

Do health insurance and hospital market concentration influence hospital patients' experience of care?

Caroline Hanson PhD¹  | Bradley Herring PhD¹ | Erin Trish PhD^{2,3}

¹Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland

²Schaeffer Center for Health Policy and Economics, University of Southern California, Los Angeles, California

³School of Pharmacy, University of Southern California, Los Angeles, California

Correspondence

Caroline Hanson, PhD, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, 624 North Broadway, Room 626, Baltimore, MD 21205.

Email: chanson8@jhu.edu

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Abstract

Objective: To examine the effects of insurance and hospital market concentration on hospital patients' experience of care, as hospitals may compete on quality for favorable insurance contracts.

Data Sources/Study Setting: Secondary data for 2008-2015 on patient experience from Hospital Compare's patient survey data, hospital characteristics from the American Hospital Association (AHA) Annual Survey, and insurance market characteristics from HealthLeaders-InterStudy.

Study Design: Hospital/year-level regressions predict each hospital's patient experience measure as a function of insurance and hospital market concentration and hospital fixed effects. The model is identified by longitudinal variation in insurance and hospital concentration.

Data Collection/Extraction Methods: Hospital/year-level data from Hospital Compare and the AHA merged by market/year to insurance and hospital concentration measures.

Principal Findings: Changes in patient satisfaction are positively associated with increases in insurance concentration and negatively associated with increases in hospital concentration. Moving from a market with 20th percentile insurance concentration and 80th percentile hospital concentration to a market with 80th percentile insurance concentration and 20th percentile hospital concentration increases the share of patients that rated the hospital highly from 66.9 percent (95% CI: 66.5-67.2 percent) to 67.9 percent (95% CI: 67.5-68.3 percent) and the share of patients that definitely recommend the hospital from 69.7 percent (95% CI: 69.4-70.0 percent) to 70.8 percent (95% CI: 70.5-71.2 percent). The relationship for insurance concentration is stronger in more concentrated hospital markets, while the relationship for hospital concentration is stronger in less concentrated hospital markets.

Conclusions: These findings add to the evidence on the harms of hospital consolidation but suggest that insurer consolidation may improve patient experience.

KEYWORDS

anti-trust/Health care markets/Competition, observational data/Quasi-experiments, patient assessment/satisfaction

1 | INTRODUCTION

The relationship between hospital market concentration and hospital quality has achieved substantial attention in the literature. In an administered-price setting where hospitals cannot compete on price, theory suggests that hospitals compete on quality to attract patients, so that increases in hospital market concentration worsen hospital performance.¹ The empirical literature largely supports this, with studies of the US Medicare program and England's National Health Service finding that hospital competition decreases mortality and readmission rates.^{2,3} In settings with market-determined prices, where hospitals compete on quality and price (and perhaps make tradeoffs between the two), the theoretical predictions are ambiguous, and the empirical findings more mixed. Some studies have found that hospital market concentration decreases quality,^{4,5} though other studies have found no effect,^{6,7} and some have found a positive effect.^{8,9} In addition to the literature examining hospital quality, a robust literature documents that increases in hospital market concentration increase hospital prices.¹⁰

However, little is known about the effect of insurance market concentration on hospital quality. Similar to hospitals competing with each other on quality dimensions to attract patients, hospitals may compete on quality to attain favorable contracts with insurers. As insurers consolidate, hospitals may increasingly view quality as a means to maintain bargaining leverage in their negotiations. For example, as insurance market concentration increases, hospitals may increase quality in order to increase patient pressure on the insurer to keep the hospital in-network or to strengthen their ability to negotiate higher prices. The literature on insurance concentration and price is smaller and more recent than the literature on hospital concentration and price, but several studies have shown that concentrated insurers do negotiate lower hospital prices,¹¹⁻¹⁶ but do not pass savings on to consumers in the form of lower premiums.¹⁷⁻¹⁹

We address this important gap in the literature by empirically analyzing the relationship between insurance market concentration, hospital market concentration, and hospital quality, measured here as patient experience of care. (We are unaware of any other paper examining insurance market concentration's impact on any aspect of hospital quality.)

We estimate hospital/year-level regression models predicting changes in patient experience over time as a function of changes in insurance and hospital market concentration, with hospital fixed effects to control for time-invariant unobservable hospital and market characteristics. Hospital-level data for 2008-2015 come from merging patient experience data from the Centers for Medicare & Medicaid Services' (CMS) Hospital Compare with other hospital characteristics from the general medical and surgical community hospitals in the American Hospital Association (AHA) Annual Survey. The CMS Hospital Compare data we use are Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) measures. Market-level Herfindahl-Hirschman

Indices (HHI) for insurance market concentration are constructed from HealthLeaders-InterStudy data for commercial enrollment market shares, while HHIs for hospital concentration are constructed from AHA data for all inpatient days aggregated to the system level.

We hypothesize that insurance market concentration is positively related to hospital quality, measured as patients' experience of care. We also expect that, consistent with much of the prior research, hospital concentration is negatively related to patient experience. Moreover, we hypothesize that the impact of insurer concentration will be stronger in more concentrated hospital markets, where hospital market competition plays less of a role in improving patient experience.

2 | DATA

This section first describes our hospital-level dataset and both our dependent variable and hospital controls included in the data. It then describes our market-level measures for insurance and hospital market concentration, as well as our county-level controls. Our empirical methodology is described in the subsequent section.

2.1 | Hospital-level dataset

We use measures of patient experience based on the HCAHPS survey, which is randomly sampled from adult patients across payer categories with at least one inpatient stay for a nonpsychiatric diagnosis.^{20,21} CMS publicly reports summary HCAHPS results by hospital, adjusted for patient-mix (self-reported health status, education, service line, age, admission source, and primary language), survey mode, and nonresponse bias, on the Hospital Compare website.²² We use data collected over January to December for each year during 2008-2015. (There are no quality-oriented measures other than the HCAHPS measures that are available through Hospital Compare spanning such a long period of time with annual measures. For example, Hospital Compare's mortality and readmission rates are measured over a 36-month period and there is a shorter panel of data.)

Our analysis is based on the two HCAHPS global items. The first asks patients for their overall rating of the hospital, and the second asks whether the patient would recommend the hospital. Scores are aggregated by hospital and publicly reported as the percentage of a hospital's patients in a given time period responding above a certain threshold. Our first outcome measure is the hospital's percentage of patients rating it a 9 or 10 (out of 10); this measure has been used in previous studies²³ and is the global measure used for the hospital's Experience of Care score in the CMS Hospital Value-Based Purchasing Program.²⁴ Our second outcome measure, which is highly correlated, is the hospital's percentage of patients reporting that they would definitely recommend the hospital. We test the sensitivity of our results for these two primary measures by using the remaining data on global patient experience to construct a measure of the percent of patients rating the hospital a 7 or higher and the

percent of patients reporting that they would definitely or probably recommend the hospital.

These two global scores presumably reflect several dimensions of the patient's experience, including communication with doctors and nurses, satisfaction with the hospital facilities, and perception of clinical quality. A systematic review of the relationship between patient experience and other quality measures finds that patient experience is positively associated with self-reported health status and objective measures of clinical quality, though some studies have reported a weak or no relationship.²⁵ For example, studies have found that patients treated at hospitals in the top quartile of patient satisfaction scores had lower mortality, but findings on other measures including readmissions and complications are inconsistent.²⁶⁻²⁸ In light of this evidence, patient experience scores should be thought of as one dimension of hospital quality, not a proxy for clinical quality.

We obtain information on hospital characteristics from the AHA Annual Survey of Hospitals to include as time-varying covariates in the analyses in addition to hospital fixed effects. Relevant hospital characteristics include ownership type (public, nonprofit independent, nonprofit part of a system, and for-profit), number of beds, payer mix, whether it has an accredited Graduate Medical Education program, and average length of stay. We merged the HCAHPS data to the AHA data on the basis of the CMS Certification Number, which is not a perfect one-to-one match. There are only a small number of hospitals with HCAHPS data for which there is no match in the AHA data (eg, 92 out of 4240 for 2015), and a larger number of hospitals in the AHA data with no HCAHPS data (eg, 568 out of 4612 for 2015). We restrict to hospitals with patient experience data for 2008-2015, which excludes hospitals that opened or closed over the study period, but includes hospitals whose ownership changed, as long as there is a valid CMS Certification Number for merging. The excluded hospitals are disproportionately small and rural, and so the data we use cover over 89 percent of all inpatient days over our study period. Compared to the hospitals covering the remaining 11 percent of inpatient days, our sample of hospitals significantly differs on most covariates, which is expected as having missing Hospital Compare data is unlikely to be random. These descriptive statistics for the included versus excluded hospitals are in Table S1.

2.2 | Market-level concentration measures

We construct measures of insurance and hospital market concentration and merge these market concentration measures to the hospital/year-level data. We measure market concentration using the HHI, which is widely used in the literature and by the regulatory agencies. It is measured as the sum of squared market shares on a scale from 0 to 10 000, with 10 000 representing a monopoly and HHIs approaching 0 representing perfect competition. Our empirical model (described below) uses hospital fixed effects to focus on changes in insurance and hospital market concentration over time.

For our measure of insurance market HHI, we calculate shares of commercial enrollment using the HealthLeaders-InterStudy census of private insurers. We include both fully insured and self-insured

business, as insurers would use the combined market share of both types of enrollees when negotiating provider contracts.¹⁸ Moreover, we measure market share based on combined enrollment in both the individual (nongroup) and employer markets. (We exclude exchange enrollment, though our results are robust to insurance HHI measures that do include exchange enrollment for 2014 and 2015.) We use the State Rating Areas defined by CMS' Center for Consumer Information and Insurance Oversight (CCIIO) to define the geographic markets for insurers.²⁹ Most states use metropolitan core-based statistical areas (CBSAs) as the basis for grouping their urban and suburban counties into Rating Areas; micropolitan and rural counties are then typically combined either with these existing Rating Areas and/or with each other. The median number of Rating Areas in a state is 7.

For our primary measure of hospital market HHI, we calculate shares of all inpatient days, aggregated to the system level, using the AHA Annual Survey. We use the Dartmouth Atlas' Hospital Referral Regions (HRRs) to define the geographic markets for hospitals.³⁰ We test the sensitivity of the results to different hospital HHI measures based on alternative ways of measuring market shares (using Medicare days, privately insured days, and all inpatient stays) and geographic markets (using counties).

We also collect a number of time-varying county-level control variables from various sources and merge them to the hospital-level data. These covariates control for changes in local-level characteristics which could be correlated with changes in either market concentration measure and changes in hospital patient experience over time. For example, a county's socioeconomic characteristics may affect the attractiveness of a market for a potential insurer entrant and may also be associated with patient experience. Hence, one set of county-level controls characterize the demographics of the county, including the percentage of the county's population aged 65 and older and the percentage nonwhite from the Area Health Resource File. Additionally, we include the county's real median income from the Census' Small Area Income & Poverty Estimates database, and the unemployment rate from Bureau of Labor Statistics' Local Area Unemployment Statistics. Another set of county-level controls characterize the health care market. We include the uninsured rate from the Census' Small Area Health Insurance Estimates; the HMO/POS commercial penetration rate from the HealthLeaders-InterStudy data; and Medicare Advantage penetration, number of doctors per 1000 residents, number of hospital inpatient days per capita, and number of Federally Qualified Health Centers from the Area Health Resource File.

3 | MODEL/METHODS

We estimate hospital/year-level models of hospital patient experience as a function of the observable market, hospital, and county characteristics discussed above, in addition to hospital fixed effects to account for unobserved, time-invariant factors that might affect both market concentration and patient satisfaction. Our models are

identified by variation in the level of hospital and insurance market concentration within a market over time. To illustrate the variation, Figure S1 plots the change in hospital market concentration over the study period against the change in insurance market concentration over time for each hospital. (Note that we keep consistent geographic market definitions over time, so this variation results from changes in insurer and hospital market shares.) The model takes the following form, which we estimate using OLS regression, as the dependent variables (ie, the hospital's percentage of patients rating it a 9 or 10 out of 10, or the hospital's percentage of patients reporting they would definitely recommend the hospital) both have an approximate normal distribution:

$$Y_{it} = \beta_0 + \beta_1 \text{InsHHI}_{kt} + \beta_2 \text{HspHHI}_{it} + \beta_3 \text{Hospital}_{it} + \beta_4 \text{County}_{jt} + \beta_5 \text{Year}_t + \alpha_i + \varepsilon_{it}. \quad (1)$$

In the above specification, we estimate the patient experience score Y_{it} of hospital i , in county j , in insurance market k (defined as CCIIO Rating Areas), and in hospital market l (defined as Dartmouth Atlas HRRs), and in year t . InsHHI_{kt} and HspHHI_{it} are the insurance and hospital market concentration measures, respectively; and so our coefficients of interest are β_1 and β_2 . We are interested in estimating β_1 and β_2 coefficients both for the entire sample of hospitals and (based on expectations described further below) for various stratified subsamples of hospitals based on the type of hospital and initial levels of market concentration (rather than additional interaction terms in the full sample's model). Hospital_{it} is a vector of time-varying hospital characteristics, and County_{jt} is a vector of time-varying county characteristics, both described in the Data section above. Year_t is a vector of binary year indicators, which account for time trends in patient satisfaction that were common across markets. The hospital fixed effects are denoted by α_i . Each hospital/year observation is weighted by the number of hospital beds. To account for correlation in the error terms within markets, we cluster the standard errors at the insurance market level.

3.1 | Sensitivity analyses

We conduct three sets of sensitivity analyses to determine whether the β_1 and β_2 parameters from our main model are robust to alternative specifications. The first set of sensitivity analyses uses alternative satisfaction measures for the dependent variable: defining the rating outcome measure as the percentage of respondents rating the hospital a 7 or higher (rather than 9 or higher) and defining the satisfaction outcome measure as the percentage of respondents definitely or probably recommending the hospital (rather than definitely recommending).

The second set of sensitivity analyses uses an alternative sample. We estimate the model excluding the observations of vertically integrated hospital systems, including Kaiser Permanente, Geisinger Health System, and Intermountain Healthcare. These systems still exert competitive pressure on the other actors in the market and are therefore included in the measures of insurance and hospital concentration; but because they do not undergo the typical bargaining process between an insurer and hospital, their

patient experience scores may be unresponsive to insurance market concentration.

The third set of sensitivity analyses uses alternative hospital HHI measures. The first subset uses alternative hospital utilization measures to determine market shares. We re-estimate the model with hospital HHI measures using, alternately, only Medicare inpatient days, only commercially insured inpatient days, and all hospital admissions (rather than all-payer inpatient days). The rationale for the latter is that less-efficient hospitals with longer average lengths of stay may have larger market shares based on days. The second subset uses counties to define geographic hospital markets instead of the Dartmouth Atlas HRRs.

3.2 | Stratified analyses

The extent to which hospitals respond to the competitive pressures exerted by other hospitals and by insurers may depend on certain hospital characteristics. For example, nonprofit hospitals, particularly those in systems which are often affiliated with academic medical centers, might be intrinsically motivated to provide high-quality care, so they may be relatively less sensitive to market concentration. We therefore estimate separate models for subsamples by hospital ownership type: public hospitals, nonprofit independent hospitals, nonprofit hospitals in systems, and for-profit hospitals.

Additionally, the extent to which insurers can exert pressure on hospital quality may depend on the level of hospital concentration that those insurers face, as hospitals in more competitive hospital markets may have already increased quality considerably and thus be less sensitive to insurer pressures. Similarly, the extent to which hospital competition with each other influences quality may depend on the level of insurance market concentration. We therefore consider how hospital and insurance market concentration interact with each other to affect patient experience by estimating models stratified by market concentration at the 2008 baseline. The Federal Trade Commission (FTC) and Department of Justice (DOJ) use an HHI cutoff of 2500 to distinguish between "moderately concentrated" and "highly concentrated" markets, and we follow this benchmark.^{31,32} We estimate separate models for low/moderate vs. high concentration levels for hospital markets, for low/moderate vs. high concentration levels for insurance markets, and for each pair of low/moderate vs. high concentration levels for both.

We test the significance of differences between coefficients on insurance and hospital market concentration across stratified analyses (both by hospital type and by market concentration) using seemingly unrelated estimation in Stata.

4 | RESULTS

The sample of hospitals, after imposing the restrictions described above, results in a total of 25 180 observations at 3154 hospitals over eight years and 465 insurance markets and 306 hospital markets.

TABLE 1 Summary statistics and main model's full regression results

	Mean	SD	Regression: rating 9/10		Regression: recommend	
			Coeff.	SE	Coeff.	SE
Percent giving 9/10 quality rating	67.4	7.94				
Percent giving a 7 + quality rating	90.8	3.96				
Percent definitely recommend	70.3	8.74				
Pct. def./probably recommend	94.5	3.06				
Market concentration						
Insurance HHI (1000s)	2.73	0.98	0.273**	[0.127]	0.268**	[0.124]
Hospital HHI (1000s)	2.46	1.50	-0.291*	[0.160]	-0.350**	[0.146]
Hospital characteristics						
Type: nonprofit ind. (reference)	0.20	0.40				
Type: nonprofit system	0.51	0.50	-0.572**	[0.272]	-0.725**	[0.293]
Type: for-profit	0.14	0.35	-1.795***	[0.472]	-2.016***	[0.460]
Type: public nonfederal	0.14	0.35	-0.213	[0.553]	-0.473	[0.543]
Size: 6-24 Beds (reference)	0.003	0.06				
Size: 25-49 Beds	0.02	0.15	-0.073	[0.630]	-0.088	[0.654]
Size: 50-99 Beds	0.06	0.23	-0.037	[0.702]	-0.413	[0.754]
Size: 100-199 Beds	0.18	0.38	0.079	[0.768]	-0.267	[0.811]
Size: 200-299 Beds	0.18	0.39	0.438	[0.809]	0.046	[0.847]
Size: 300-399 Beds	0.16	0.36	0.408	[0.843]	-0.026	[0.886]
Size: 400-499 Beds	0.11	0.32	0.971	[0.907]	0.339	[0.951]
Size: 500 + Beds	0.28	0.45	1.423	[0.945]	0.829	[0.967]
Medicare share (Days)	0.49	0.13	-1.499***	[0.567]	-1.398***	[0.538]
Medicaid share (Days)	0.21	0.12	0.263	[0.624]	-0.060	[0.689]
Graduate medical education	0.51	0.50	0.010	[0.194]	-0.042	[0.193]
Average length of stay	4.99	2.06	-0.072**	[0.033]	-0.079***	[0.029]
County characteristics						
Non-CBSA (vs. CBSA) County	0.04	0.19				
Fraction age 65+	0.14	0.03	-14.05	[9.194]	-14.98	[9.288]
Fraction nonwhite	0.37	0.21	2.341	[6.461]	1.860	[6.615]
Median income (\$1000s)	55.9	14.2	-0.012	[0.025]	-0.022	[0.024]
Unemployment rate	0.08	0.03	5.050	[5.593]	1.562	[5.277]
Fraction uninsured	0.16	0.06	-7.288*	[4.079]	-5.662	[3.564]
HMO/POS penetration	0.35	0.16	1.853**	[0.805]	1.726**	[0.760]
Medicare adv. penetration	0.27	0.14	-1.885	[2.120]	-0.300	[2.009]
MDs per 1000	2.94	2.04	0.019	[0.172]	0.106	[0.179]
Inpatient days per capita	0.71	0.51	0.058	[0.138]	0.0126	[0.141]
FQHC in county	0.86	0.35	0.056	[0.322]	-0.097	[0.303]
Year indicators (2008)						
2009			2.335***	[0.224]	1.593***	[0.211]
2010			3.915***	[0.261]	2.505***	[0.253]
2011			4.946***	[0.281]	3.073***	[0.280]
2012			6.175***	[0.293]	3.773***	[0.304]
2013			7.039***	[0.326]	4.032***	[0.343]
2014			7.166***	[0.416]	3.979***	[0.408]
2015			7.648***	[0.518]	3.972***	[0.499]

(Continues)

TABLE 1 (Continued)

	Mean	SD	Regression: rating 9/10		Regression: recommend	
			Coeff.	SE	Coeff.	SE
Constant			65.60***	[3.594]	71.77***	[3.724]
R ²			0.842		0.874	

Note: Sample consists of 25 180 observations over 3154 unique hospitals. Summary statistics and regressions are weighted by the number of hospital beds. The regressions include hospital fixed effects.

Abbreviations: FQHC, Federally Qualified Health Center; HHI, Herfindahl-Hirschman Index.

Statistical significance: *** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$.

(Because of sporadically missing confounder data, the number of observations is not an exact multiple of the number of hospitals.)

The first panel of Table 1 presents summary statistics for the analytical sample over the 2008-2015 period, weighted by number of beds. Across hospitals, the mean percentage of patients rating their hospital a 9 or 10 over the study period was 67.4 percent and the mean percentage of patients reporting they would definitely recommend the hospital was 70.3 percent, with standard deviations across hospitals of 7.94 percent and 8.74 percent, respectively. Figure S2 illustrates the change in these average scores over the study period. The average insurance market HHI faced by hospitals during this time was 2726, while the average hospital market HHI was 2459; both are right around the FTC/DOJ "highly concentrated" benchmark of 2500. (Note that the unit of observation here is the hospital, so these measures of mean market concentration differ from means reported elsewhere that reflect averages across markets or the population.) Table S2 provides more detail on the distribution of the patient experience scores and insurance and hospital concentration measures over hospital/years. The typical hospital bed in our sample is in a hospital that is a member of a non-profit hospital system with between 200 and 299 beds and located in a metropolitan market.

The second and third panels of Table 1 present the results for the main model. A 1000-point increase in insurance concentration increases the percentage who rate the hospital a 9 or 10 by 0.273 percentage points ($P = 0.032$) and the percentage who would definitely recommend the hospital by 0.268 percentage points ($P = 0.030$), while a 1000-point increase in hospital concentration decreases these scores by 0.291 percentage points ($P = 0.069$) and 0.350 percentage points ($P = 0.017$). With the inclusion of hospital fixed effects, the control variables should be interpreted as changes in these characteristics over time. There is also a notable time trend (consistent with Figure S2), with patient experience scores moving steadily upward over the study period.

To illustrate the magnitude of these results for changes in insurance and hospital market concentration, we consider the change in patient experience associated with moving to the 20th percentile of hospital concentration observed in the data (HHI = 1293) and the 80th percentile of insurance concentration (HHI = 3332) from the 80th percentile of hospital concentration (HHI = 3439) and the 20th percentile of insurance concentration (HHI = 2004). About 4.4 percent of the hospital/year observations jointly have these lowest

levels of hospital concentration and highest levels of insurance concentration, while about 4.0 percent of the hospital/year observations jointly have these highest levels of hospital concentration and lowest levels of insurance concentration. (Figure S3 illustrates the joint distribution of insurance and hospital market concentration across the hospitals in our sample for 2015.) This change in the joint distribution of market concentration would increase the percentage who rate the hospital a 9 or 10 from about 66.9 percent (95% CI: 66.5-67.2 percent) to about 67.9 percent (95% CI: 67.5-68.3 percent) and would increase the percentage who would definitely recommend the hospital from about 69.7 percent (95% CI: 69.4-70.0 percent) to about 70.8 percent (95% CI: 70.5-71.2 percent); both of which are differences of about 0.13 standard deviations in the measures across hospitals. These changes correspond to a hospital's patient rating increasing from roughly the 41st to 45th percentile of its distribution and a hospital's patient satisfaction moving from the 48th to 52nd percentile. Figure 1A and B shows these two predicted patient experience measures for all possible combinations of insurance and hospital market concentration.

Table 2 presents the results of the sensitivity analyses, with only the coefficients on insurance and hospital market concentration reported and the first and second pairs of columns corresponding to the rating and recommended measures, respectively. In the first set of sensitivity results, the effect of hospital market concentration is robust to redefining the outcome measure as a rating of 7 or higher and to redefining the outcome measure as definitely/probably recommend the hospital, while the effect of insurance concentration is comparable but not statistically significant. In the second set of sensitivity results, the findings are robust to excluding vertically integrated systems. In the third set of sensitivity analyses, the effect of insurance market concentration is robust to calculating hospital HHIs with Medicare days, with private days, and with hospital admissions instead of inpatient days. However, hospital HHIs calculated using private hospital days do not significantly affect patient satisfaction, suggesting that the findings in the main model may be primarily driven by competition for Medicare patients. While this is somewhat surprising because hospital HHI measures are highly correlated whether defined by all patients, Medicare patients, or private patients, this pattern is plausible given that hospital competition should have stronger quality implications in Medicare where prices are administered. The results on insurance market concentration are robust to using counties to define the geographic hospital market;

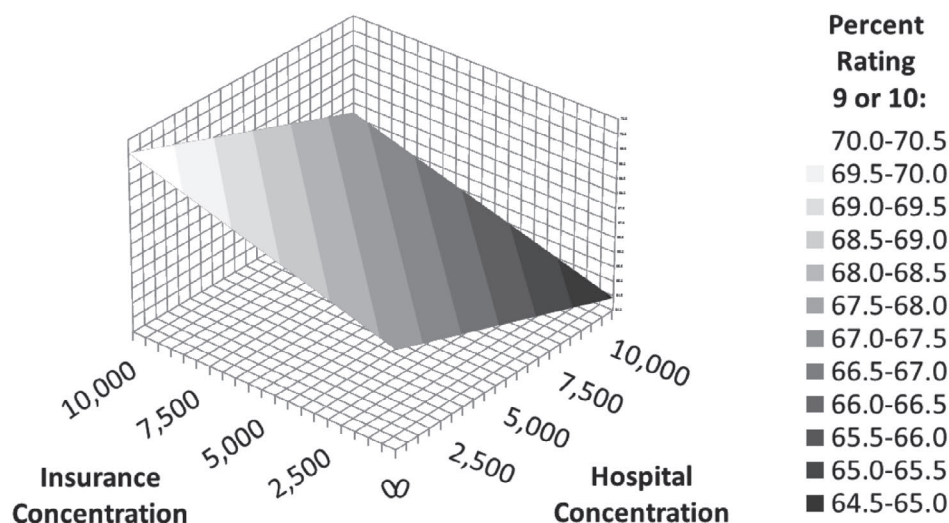
the effect of hospital market concentration is not robust to using counties to define hospital markets.

Table 3 presents the results for the analysis stratified by hospital type. While we do not generally observe statistically significant differences between the coefficients for the hospital type stratifications, the magnitude of the coefficient for insurance market concentration is slightly larger among independent nonprofit systems and for-profit hospitals, relative to hospitals in a nonprofit system; for the definitely recommend outcome measure, the effect of insurance concentration among for-profit hospitals is significantly different from nonprofit systems ($P = 0.046$). The magnitudes of the effect

of hospital market concentration are slightly larger among hospitals that are not members of a nonprofit system, though in general, neither the point estimates nor the tests of differences are statistically significant. We also considered whether the effect varied by a hospital's teaching status, but we do not report those results as those magnitudes were similar to each other.

Table 4 presents the results for the analyses stratified by low/moderate versus high insurance and hospital market concentration, again reporting only the coefficients on hospital and insurance market concentration for the two outcome measures. The insurance market concentration's coefficient is larger in magnitude

Panel A: Percent of Patients Rating the Hospital a 9 or 10



Panel B: Percent of Patients Definitely Recommending the Hospital

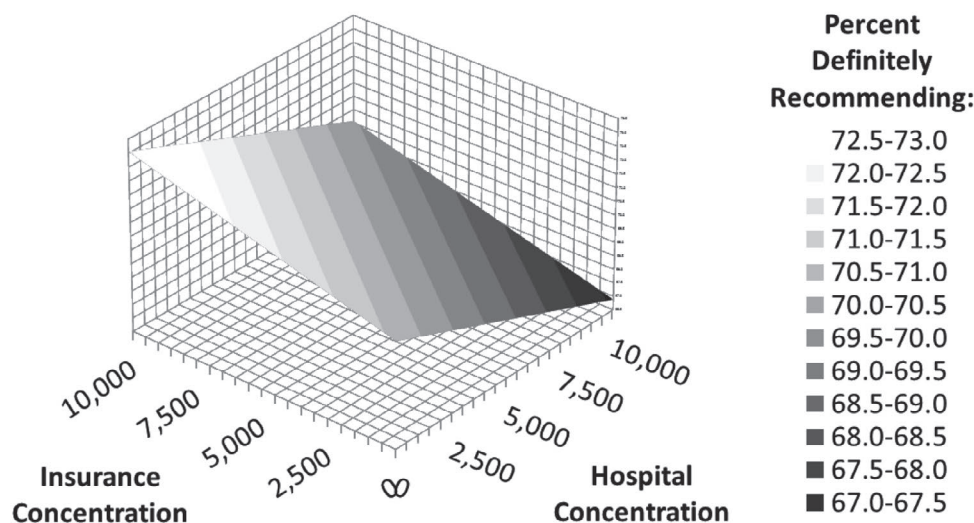


FIGURE 1 Predicted patient experience by level of insurance and hospital market concentration
 Note: The predicted values are based on the results shown in Table 1.

TABLE 2 Results from sensitivity analyses: coefficients for insurance and hospital market concentration

Model specification	DV = Percent giving a rating of 9 or 10		DV = Percent definitely recommending	
	Insurance market HHI coefficient	Hospital market HHI coefficient	Insurance market HHI coefficient	Hospital market HHI coefficient
Main model	0.273 [0.127]**	-0.291 [0.160]*	0.268 [0.124]**	-0.350 [0.146]**
Alternative dependent variables				
Percent giving a quality rating of 7+	0.151 [0.097]	-0.227 [0.084]***		
Percent definitely/probably Recommending			0.101 [0.064]	-0.174 [0.053]***
Alternative sampling				
Drop vertically integrated systems	0.253 [0.129]**	-0.253 [0.161]	0.249 [0.125]**	-0.321 [0.147]**
Alternative hospital HHI measures				
Uses Medicare days for market share	0.264 [0.126]**	-0.450 [0.151]***	0.261 [0.122]**	-0.444 [0.142]***
Uses private days for market shares	0.276 [0.128]**	0.0537 [0.126]	0.273 [0.125]**	-0.0155 [0.122]
Uses all hospital admissions for market shares	0.270 [0.126]**	-0.559 [0.202]***	0.265 [0.123]**	-0.592 [0.190]***
Uses counties for geographic areas	0.270 [0.103]***	-0.071 [0.083]	0.208 [0.147]	-0.103 [0.090]

Note: The main model on the first row repeats the results shown in Table 1. Regressions are weighted by the number of hospital beds and include hospital fixed effects. Standard errors are shown in brackets.

Abbreviations: DV, Dependent variable; HHI, Herfindahl-Hirschman Index.

Statistical significance: *** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$. Standard errors are shown in brackets.

TABLE 3 Results from stratified analyses by hospital type

Subsample	DV = Percent giving a rating of 9 or 10		DV = Percent definitely recommending	
	Insurance market HHI coefficient	Hospital market HHI coefficient	Insurance market HHI coefficient	Hospital market HHI coefficient
Main model (Not stratified) (N = 25 180)	0.273 [0.127]**	-0.291 [0.160]*	0.268 [0.124]**	-0.350 [0.146]**
Nonprofit system hospital subsample (N = 11 235)	0.113 [0.241]	0.060 [0.226]	0.113 [0.223]	-0.053 [0.213]
Nonprofit independent hospital subsample (N = 5440)	0.418 [0.195]**	-0.487 [0.299]	0.397 [0.216]*	-0.248 [0.292]
For-profit hospital subsample (N = 4191)	0.652 [0.266]**	-0.541 [0.419]	0.727 [0.271]***,a	-0.733 [0.386]*
Public hospital subsample (N = 4314)	0.060 [0.263]	-0.504 [0.322]	-0.083 [0.279]	-0.701 [0.348]**

Notes: The main model on the first row repeats the results shown in Table 1. Regressions are weighted by the number of hospital beds and include hospital fixed effects. Standard errors are shown in brackets.

Abbreviations: DV, Dependent variable; HHI, Herfindahl-Hirschman Index.

^aIndicates that coefficient is significantly different from comparison coefficient at the 0.05 level. The coefficients for nonprofit independent hospitals, for-profits, and public hospitals are each tested against the coefficient for nonprofit hospitals in a system.

Statistical significance: *** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$.

in more concentrated (HHI > 2500) hospital markets, with a 1000-point increase in insurance HHI increasing patient experience by 0.590 percentage points ($P = 0.002$) for the rating measure and 0.469 percentage points ($P = 0.009$) for the recommendation measure. For the rating outcome measure, this difference is statistically significant ($P = 0.03$). Conversely, the hospital market concentration's coefficient is larger in magnitude, though not significantly different, in less concentrated hospital markets, with a 1000-point increase in hospital HHI in a hospital market with low/moderate concentration at baseline decreasing the patient rating score by

0.591 points ($P = 0.047$) and the recommend score by 0.560 points ($P = .033$), compared to no effect in a hospital market that was highly concentrated at baseline. The hospital market concentration's coefficient is larger in magnitude, though not statistically different, in more concentrated insurance markets, with a 1000-point increase in hospital HHI decreasing patient satisfaction by 0.352 percentage points ($P = 0.077$) or 0.393 percentage points ($P = 0.026$). Moreover, the insurance market concentration's coefficient is largest when insurance markets are not concentrated and hospital markets are concentrated, improving patient experience

TABLE 4 Results from stratified analyses by low/moderate vs. high market concentration

Subsample	DV = Percent giving a rating of 9 or 10		DV = Percent definitely recommending	
	Insurance market HHI coefficient	Hospital market HHI coefficient	Insurance market HHI coefficient	Hospital market HHI coefficient
All insurance markets, all hospital markets (N = 25 180)	0.273 [0.127]**	-0.291 [0.160]*	0.268 [0.124]**	-0.350 [0.146]**
All insurance markets, hospital HHI < 2500 (N = 16 780)	0.106 [0.153]	-0.591 [0.297]**	0.164 [0.153]	-0.560 [0.262]**
All insurance markets, hospital HHI > 2500 (N = 8398)	0.590 [0.187]**, ^a	-0.125 [0.180]	0.469 [0.178]**	-0.220 [0.164]
Insurance HHI < 2500, all hospital markets (N = 10 050)	0.186 [0.320]	-0.082 [0.221]	0.269 [0.290]	-0.179 [0.213]
Insurance HHI > 2500, all hospital markets (N = 15 130)	0.151 [0.128]	-0.352 [0.198]*	0.120 [0.132]	-0.393 [0.175]**
Insurance HHI < 2500, hospital HHI < 2500 (N = 7061)	-0.276 [0.352]	-0.584 [0.499]	-0.001 [0.346]	-0.598 [0.463]
Insurance HHI > 2500, hospital HHI < 2500 (N = 9719)	0.0465 [0.155]	-0.442 [0.352]	0.0176 [0.160]	-0.330 [0.307]
Insurance HHI < 2500, hospital HHI > 2500 (N = 2,989)	1.181 [0.540]**, ^a	0.102 [0.215]	0.799 [0.486]	-0.0513 [0.221]
Insurance HHI > 2500, hospital HHI > 2500 (N = 5409)	0.345 [0.189]*	-0.206 [0.228]	0.282 [0.189]	-0.318 [0.188]*

Note: The main model on the first row repeats the results shown in Table 1. Regressions are weighted by the number of hospital beds and include hospital fixed effects. Standard errors are shown in brackets.

Abbreviations: DV, Dependent variable; HHI, Herfindahl-Hirschman Index.

^aIndicates that coefficient is significantly different from comparison coefficient at the 0.05 level. Coefficients for hospital markets > 2500 are tested against hospital markets < 2500, coefficients for insurance markets > 2500 are tested against insurance markets < 2500 and the high/high, low/high, and high/low combinations of hospital and insurance market concentration are tested against hospital and insurance markets < 2500.

Statistical significance: *** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$.

by 1.181 percentage points ($P = 0.032$) or 0.799 percentage points ($P = 0.104$).

5 | DISCUSSION AND LIMITATIONS

We find that insurance market concentration positively impacts the patient's experience of care, an important dimension of hospital quality, and that, consistent with much of the prior research, hospital concentration negatively impacts this measure of hospital quality. Moving from a market at the 20th percentile of insurance concentration and the 80th percentile of hospital concentration (consistent with 4.0 percent of the joint distribution) to a market at the 80th percentile of insurance and the 20th percentile of hospital concentration (consistent with 4.4 percent of the joint distribution) increases the patient rating score from 66.9 percent to 67.9 percent and the patient recommendation score from 69.7 percent to 70.8 percent. These changes in patient satisfaction would be consistent with moving from the 41st percentile to the 45th percentile in the distribution of patient rating scores across hospitals and with moving from the 48th percentile to the 52nd percentile in the distribution of patient recommendation scores. We interpret these as relatively modest yet nontrivial direct impacts on patient experience.

Moreover, insurance market consolidation is relatively more beneficial to patient experience when the hospital market is more concentrated, and hospital market consolidation is relatively more detrimental to patient experience when the hospital market is less concentrated. This suggests that when a hospital market is not concentrated, other hospitals exert enough competitive pressure that insurance concentration has no additional impact on quality, but when a hospital market is concentrated (and hence has fewer competitors), pressure by insurers becomes more important.

We also find that the positive association of insurance market concentration with patient experience is particularly pronounced among for-profit hospitals and independent nonprofit hospitals. This may suggest that these types of hospitals are more responsive to competitive market pressures compared to nonprofit hospital systems and public hospitals. The former, which are commonly affiliated with academic medical centers and generally tend to have higher patient satisfaction scores, may be more intrinsically likely to prioritize quality absent competitive pressure. Public hospitals tend to serve a different patient population and, as a result, not be as affected by commercial insurance market conditions.

Our analyses have several limitations. First, HCAHPS patient experience measures may not correlate very strongly with more clinically oriented quality measures, and we have a limited ability

to explore the effect on patients who rate the hospital very poorly. Second, consistently defining insurance and hospital markets across the country is a challenge. There is variation across states in how those regulators elected to define insurance rating areas for CCIIO. The Dartmouth HRRs reflect geographic markets for tertiary care hospitals, which are likely larger than the relevant geographic market for community hospitals. Furthermore, the proper utilization measure to define hospital market shares is unclear, though we used several approaches. Finally, hospital and insurer decisions to merge or enter/exit a market are not random, and drawing a causal conclusion from our study relies on the assumption that the (unmeasured) confounding factors were constant over time.

Regarding the policy implications of these findings, most analyses of market dynamics on provider quality focus on provider market concentration, but we find that insurance market concentration also impacts this dimension of quality. As noted above, we view the magnitude of the effects we observe as modest but not trivial. An overall assessment of the effects of consolidation in insurance and provider markets weighs the benefits against the harms (with those harms largely being tied to higher insurer administrative overhead and higher provider prices). Our research furthers the prior evidence on the harms of hospital market consolidation (observed, as noted above, in a portion of that literature) but suggests that, at least on this dimension, insurance market concentration may have some benefits, particularly in markets that lack robust hospital competition.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to report and no other disclosures.

ORCID

Caroline Hanson  <https://orcid.org/0000-0002-1963-9387>

REFERENCES

- Gaynor M, Ho K, Town RJ. The industrial organization of health-care markets. *J Econ Lit.* 2015;53(2):235-284.
- Kessler DP, McClellan MB. Is hospital competition socially wasteful? *Q J Econ.* 2000;115(2):577-615.
- Gaynor M, Moreno-Serra R, Propper C. Death by market power: reform, competition, and patient outcomes in the national health service. *Am Econ J: Econ Policy.* 2013;5(4):134-166.
- Escarce JJ, Jain AK, Rogowski J. Hospital competition, managed care, and mortality after hospitalization for medical conditions: evidence from three states. *Med Care Res Rev.* 2006;63(6):112S-140S.
- Cutler DM, Huckman RS, Kolstad JT. Input constraints and the efficiency of entry: lessons from cardiac surgery. *Am Econ J: Econ Policy.* 2010;2(1):51-76.
- Ho V, Hamilton BH. Hospital mergers and acquisitions: does market consolidation harm patients? *J Health Econ.* 2000;19(5):767-791.
- Romano PS, Balan DJ. A retrospective analysis of the clinical quality effects of the acquisition of Highland Park hospital by Evanston Northwestern healthcare. *Int J Econ Bus.* 2011;18(1):45-64.
- Encinosa WE, Bernard DM. Hospital finances and patient safety outcomes. *Inquiry.* 2005;42(1):60-72.
- Propper C, Burgess S, Gossage D. Competition and quality: evidence from the NHS internal market 1991-9. *Econ J.* 2008;118(1):138-170.
- Gaynor M, Town RJ. Chapter nine - Competition in health care markets. In: McGuire TG, Barros PP, Pauly MV, eds. *Handbook of Health Economics.* New York, NY: Elsevier; 2011:499-637.
- Moriya AS, Vogt WB, Gaynor M. Hospital prices and market structure in the hospital and insurance industries. *Health Econ Policy Law.* 2010;5(4):459-479.
- Halbersma RS, Mikkers M, Motchenkova E, Motchenkova I. Market structure and hospital-insurer bargaining in the Netherlands. *Eur J Health Econ.* 2011;12(6):589-603.
- Melnick G, Shen YC, Wu VY. The increased concentration of health plan markets can benefit consumers through lower hospital prices. *Health Aff.* 2011;30(9):1728-1733.
- McKellar MR, Naimier S, Landrum MB, Gibson TB, Chandra A, Chernew M. Insurer market structure and variation in commercial health care spending. *Health Serv Res.* 2014;49(3):878-892.
- Ho K, Lee R. Insurer competition in health care markets. *Econometrica.* 2017;85(2):379-417.
- Dauda S. Hospital and health insurance markets concentration and inpatient hospital transaction prices in the U.S. health care market. *Health Serv Res.* 2018;53(2):1203-1226.
- Dafny L, Duggan M, Ramanarayanan S. Paying a premium on your premium? Consolidation in the us health insurance industry. *Am Econ Rev.* 2012;102(2):1161-1185.
- Trish EE, Herring BJ. How do health insurer market concentration and bargaining power with hospitals affect health insurance premiums? *J Health Econ.* 2015;42:104-114.
- Dafny L, Gruber J, Ody C. More insurers lower premiums: evidence from initial pricing in the health insurance marketplaces. *Am J Health Econ.* 2015;1(1):53-81.
- Centers for Medicare and Medicaid Services. The HCAHPS Survey - Frequently asked questions. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Downloads/HospitalHCAHPSFactSheet201007.pdf>. Accessed February 1, 2019.
- Hospital Consumer Assessment of Healthcare Providers and Systems. Mode & patient-mix adjustment. <http://www.hcahpsonline.org/en/mode-patient-mix-adj>. Accessed February 1, 2019.
- Centers for Medicare and Medicaid Services. Hospital compare data archive. <https://data.medicare.gov/data/archives/hospital-compare>. Accessed February 1, 2019.
- Jha AK, Orav J, Zheng J, Epstein AM. Patients' perception of hospital care in the United States. *N Engl J Med.* 2008;359(18):1921-1931.
- Centers for Medicare and Medicaid Services. The hospital Value-Based Purchasing (VBP) program. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HVBP/Hospital-Value-Based-Purchasing.html>. Accessed February 1, 2019.
- Doyle C, Lennox L, Bell D. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. *BMJ Open.* 2013;3:e001570.

26. Kennedy GD, Tevis SE, Kent KC. Is there a relationship between patient satisfaction and favorable outcomes? *Ann Surg*. 2014;260(4):592-600.
27. Tsai TC, Orav EJ, Jha AK. Patient satisfaction and quality of surgical care in US hospitals. *Ann Surg*. 2015;261(1):2-8.
28. Sacks GD, Lawson EH, Dawes AJ, et al. Relationship between hospital performance on a patient satisfaction survey and surgical quality. *JAMA Surg*. 2015;150(9):858-864.
29. Center for Consumer Information and Insurance Oversight. Market rating reforms: state specific geographic rating areas. <https://www.cms.gov/cciiio/programs-and-initiatives/health-insurance-market-reforms/state-gra.html>. Accessed February 1, 2019.
30. Dartmouth Atlas of Healthcare. Hospital referral regions. <http://archive.dartmouthatlas.org/data/region>. Accessed February 1, 2019.
31. Department of Justice. Herfindahl-hirschman index. <https://www.justice.gov/atr/herfindahl-hirschman-index>. Accessed February 1, 2019.
32. Department of Justice and the Federal Trade Commission. Horizontal merger guidelines. <https://www.justice.gov/atr/horizontal-merger-guidelines-08192010>. Accessed February 1, 2019.

SUPPORTING INFORMATION

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